

OCR Paper 5H Practice Booklet

22 practice questions based on the advance information

Copies of this booklet, as well as hints & solutions, are available at bossmaths.com/advanceinfo

Question 1

(a) Work out $\frac{0.72 + 0.6}{0.3}$, writing your answer as a decimal.

$$= \frac{1.32}{0.3} = \frac{13.2}{3} = \underline{4.4}$$

$$3 \overline{)13.2} \begin{array}{r} 4.4 \\ \underline{12} \\ 12 \\ \underline{12} \\ 0 \end{array}$$

(b) Work out $\frac{9}{7} - 4 \times \frac{3}{14}$, writing your answer as a fraction.

$$= \frac{9}{7} - \frac{12}{14} = \frac{9}{7} - \frac{6}{7} = \frac{3}{7}$$

Question 2

Work out $9.5 \times 10^8 + 60,200,000$, writing your answer in standard form.

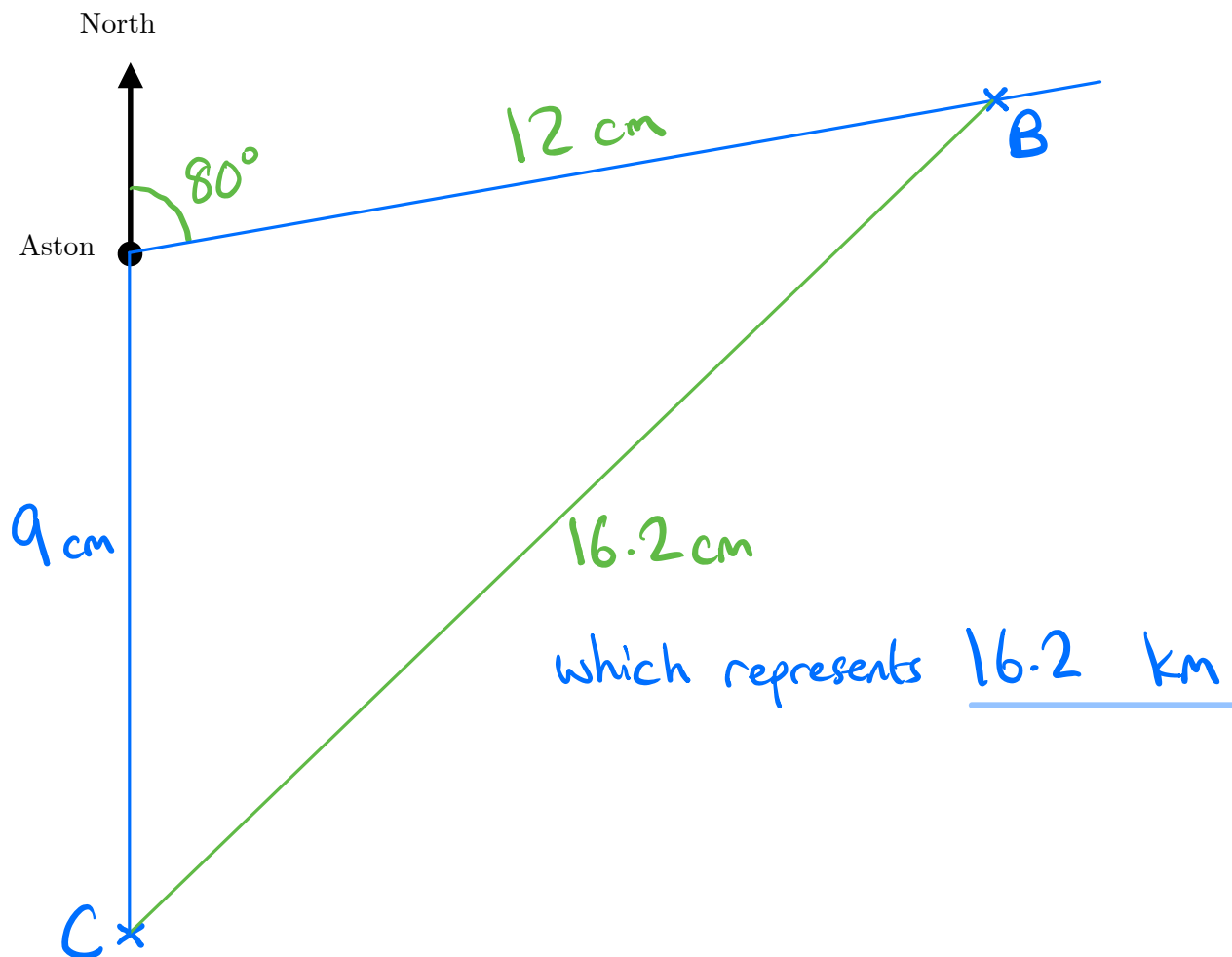
$$\begin{aligned} & 9.5 \times 10^8 + 6.02 \times 10^7 \\ &= 9.5 \times 10^8 + 0.602 \times 10^8 \\ &= 10.102 \times 10^8 \\ &= \underline{1.0102 \times 10^9} \end{aligned}$$

Question 3

The town of Bridgham is a distance of 12 km from Aston, on a bearing of 080° from Aston.
Charlton is 9 km south of Aston.

Using a scale of 1 : 100,000, draw a scale diagram showing the locations of Aston, Bridgham and Charlton.

Use your scale diagram to then find the real-world straight-line distance between Bridgham and Charlton correct to the nearest 0.1 km.



1 unit : 100,000 units

1 cm : 100,000 cm

1 cm : 1000 m

1 cm : 1 km

Question 4

Simplify each of these expressions as far as possible.

$$\begin{aligned} \text{(a)} \quad 5\sqrt{44} - 8\sqrt{11} &= 5\sqrt{4}\sqrt{11} - 8\sqrt{11} \\ &= 5 \times 2\sqrt{11} - 8\sqrt{11} = 10\sqrt{11} - 8\sqrt{11} = \underline{2\sqrt{11}} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad \sqrt{34} \times \sqrt{17} &= \sqrt{2} \times \sqrt{17} \times \sqrt{17} = \sqrt{2} \times (\sqrt{17} \times \sqrt{17}) \\ &= \sqrt{2} \times 17 = \underline{17\sqrt{2}} \end{aligned}$$

Expand and simplify each of these expressions as far as possible.

$$\begin{aligned} \text{(c)} \quad -7x - 3(9 - 2x) &\equiv -7x + -3(9 - 2x) \\ &\equiv -7x - 27 + 6x \\ &\equiv \underline{-x - 27} \end{aligned}$$

Many students go wrong here!

$$\text{(d)} \quad (x - 3)(x + 10)(x + 3)$$

$$\begin{aligned} &(x - 3)(x + 10)(x + 3) \\ &\equiv (x^2 + 7x - 30)(x + 3) \\ &\equiv x^3 + 3x^2 + 7x^2 + 21x \\ &\quad - 30x - 90 \\ &\equiv \underline{x^3 + 10x^2 - 9x - 90} \end{aligned}$$

In this case, spotting that we have a difference of two squares could save a bit of time:

$$\begin{aligned} &(x - 3)(x + 3)(x + 10) \\ &\equiv (x^2 - 9)(x + 10) \\ &\equiv \underline{x^3 + 10x^2 - 9x - 90} \end{aligned}$$

Question 5

(e) Here are five powers of 17:

17^1

17^{20}

17^{60}

17^{80}

17^{93}

Fill in each blank using one of the above powers of 17:

17^1 is prime.

17^{60} is both a square and a cube number.

17^{93} is a cube number but not a square number.

(b) Here are six numbers:

5^4

4^5

$4^{\frac{1}{5}}$

$(-4)^5$

4^{-5}

$\frac{5}{4}$

Fill in each blank using one of the above six numbers.

4^5 and 4^{-5} are reciprocals of each other.

4^5 and $(-4)^5$ sum to 0.

(c) Circle the number that is both a multiple of 8 and a factor of 8.

1

2

4

8

16

(d) Write $\frac{3}{8}$ as a decimal.

0.375

Method 1

$$8 \overline{) 3.0000} \\ \underline{0.375} \\ 3.0000$$

Method 2

$$\frac{1}{4} = 0.250$$

$$\frac{1}{8} = 0.125 \quad \text{so} \quad \frac{3}{8} = 3 \times 0.125$$

Question 6

Work out $(8 \times 10^{15})^{-\frac{2}{3}}$, writing your answer in standard form.

$$\begin{aligned}(8 \times 10^{15})^{-\frac{2}{3}} &= \left(\left((8 \times 10^{15})^{\frac{1}{3}} \right)^2 \right)^{-1} = \left((2 \times 10^5)^2 \right)^{-1} \\ &= (4 \times 10^{10})^{-1} = 4^{-1} \times 10^{-10} \\ &= 0.25 \times 10^{-10} = \underline{2.5 \times 10^{-11}}\end{aligned}$$

Question 7

By writing each number correct to 1 significant figure, find an estimate for this calculation.

$$\frac{8.03 \times 5.92}{2.97}$$

$$\frac{8 \times 6}{3} = \frac{48}{3} = \underline{16}$$

Question 8

(a) Simplify the ratio 16 : 80 : 48 as far as possible

$$1 : 5 : 3$$

(b) Rami, Sami, and Tanya share some sweets in the ratio 33 : 70 : 28
Sami then gives 10% of his sweets to Tanya.

Fill in the blank:

Tanya has% more sweets than she did before Sami gave her some of his sweets.

$$10\% \text{ of } 70 = 7$$

$$\frac{7}{28} = \frac{1}{4} = 25\%$$

(c) After receiving 10% of Sami's sweets, Tanya decides to give a fraction of her sweets to Rami so that she and Rami have an equal number of sweets.

What fraction of her sweets does she need to give to Rami?

$$33 : 63 : 35$$

Tanya needs to give Rami $\frac{1}{35}$ of her sweets.

Question 9

p is inversely proportional to q . When $p = 14.5$, $q = 2$. Find the value of q when $p = 580$.

$$pq = k = 14.5 \times 2 = 29$$

$$\text{Solving } 580q = 29$$

$$q = \frac{29}{580} = \frac{1}{20} \text{ or } 0.05$$

Question 10

(a) Write $0.1\dot{0}\dot{3}$ as fraction in its simplest form.

$$\text{Let } x = 0.1030303\dots$$

$$\text{So } x = \frac{10.2}{99} = \frac{102}{990}$$

$$\text{Then } 100x = 10.3030303\dots$$

$$\text{Subtract } x = 0.1030303\dots$$

$$= \frac{34}{330} = \frac{17}{165}$$

$$\text{to get } 99x = \underline{10.2}$$

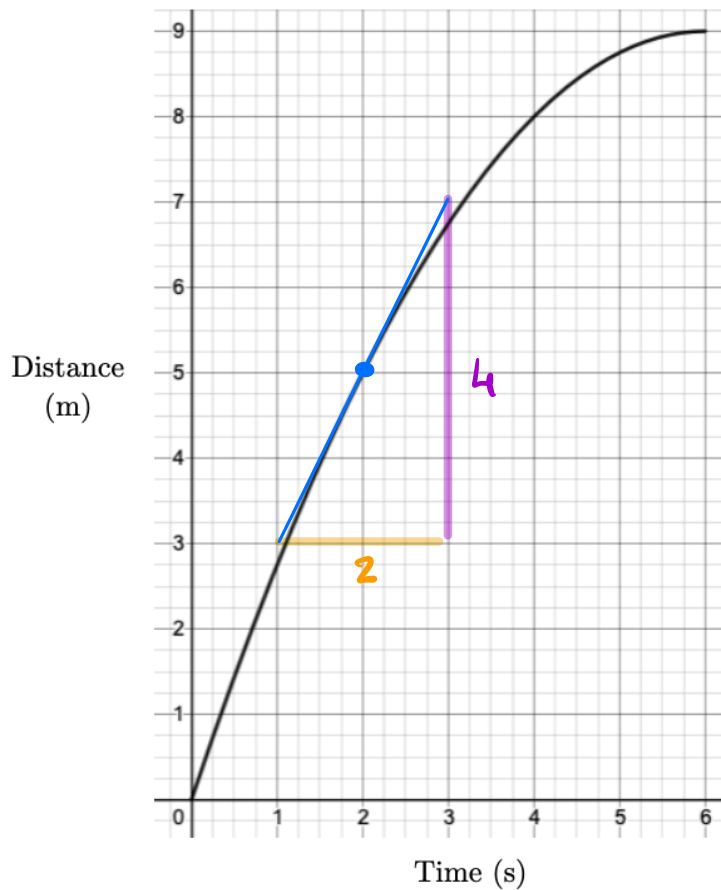
(b) A bag contains 330 sweets. The probability of picking an orange sweet from this bag is $0.1\dot{0}\dot{3}$. How many orange sweets are in the bag?

We would expect an orange sweet

$\frac{17}{165}$ or $\frac{34}{330}$ of the time. $\frac{34}{330}$ of 330 is 34.

Question 11

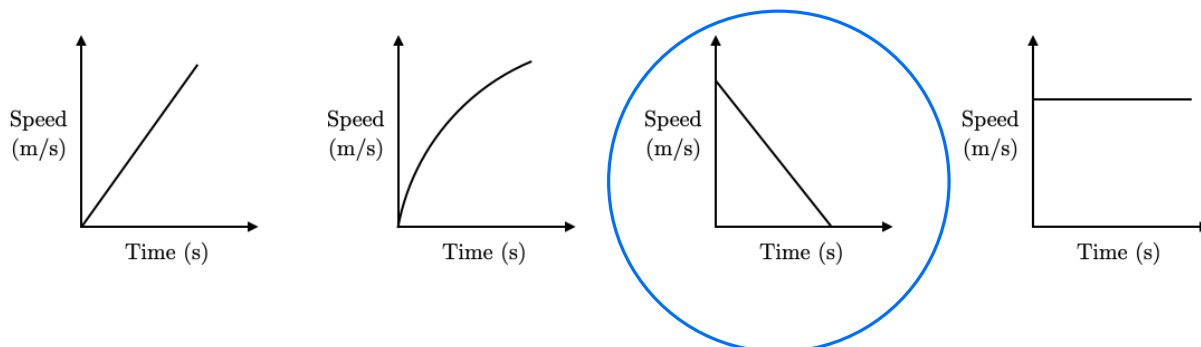
The graph shows the distance covered by a cyclist for 6 seconds.



(a) Estimate the speed of the cyclist at the moment she had travelled 5 metres.

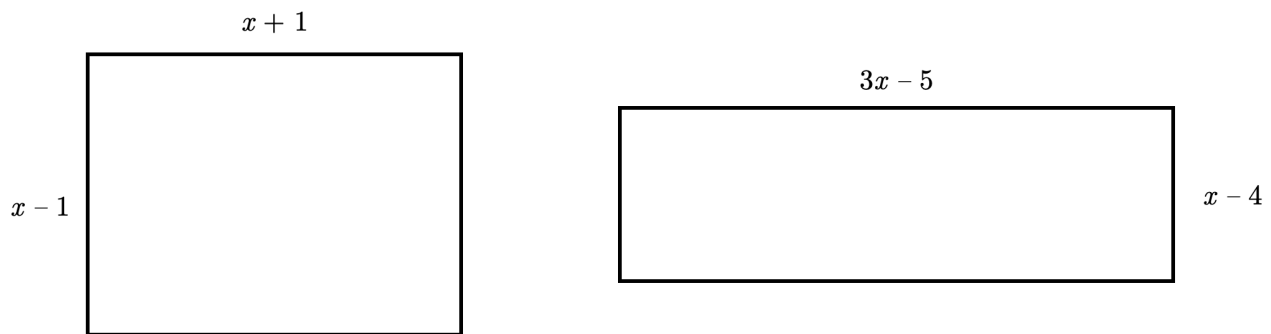
↪ gradient of a distance-time curve $\frac{4}{2} = 2 \text{ m/s}$

(b) Here are four sketches of speed-time graphs. Circle the sketch that represents the cyclist's speed during the six-second period shown above.



Question 12

The diagram shows two rectangles. The lengths and widths of each rectangle, in cm, are given.



Not drawn accurately

The two rectangles have the same area. Find the value of x .

$$(x-1)(x+1) = (3x-5)(x-4)$$

$$\Rightarrow x^2 - 1 = 3x^2 - 17x + 20$$

$$\Rightarrow 0 = 2x^2 - 17x + 21$$

$$\Rightarrow 0 = (2x - 3)(x - 7)$$

$$\Rightarrow x = \frac{3}{2}, x = 7$$

Reject this, since this would mean the second rectangle has negative length and width.

$$\text{So } \underline{x = 7}$$

Question 13

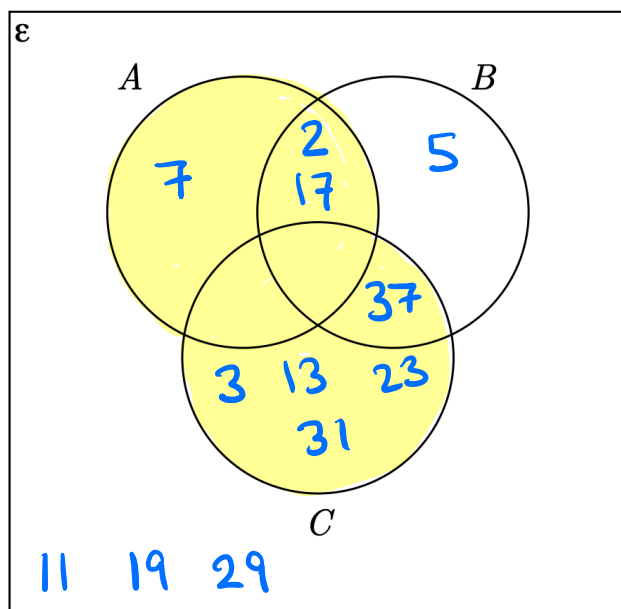
$\epsilon = \{\text{prime numbers between 1 and 40}\}$

$A = \{2, 7, 17\}$

$B = \{2, 5, 17, 37\}$

$C = \{3, 13, 23, 31, 37\}$

(a) Complete the Venn diagram for this information.



(b) A number is chosen at random from ϵ . Find the probability that the number is a member of B given that it is a member of $A \cup C$.

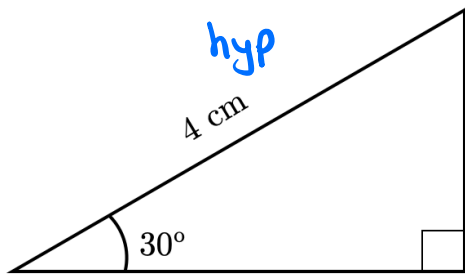
$$\frac{3}{8}$$

← 3 members of B that are also members of $A \cup C$

← 8 members of $A \cup C$

Question 14

This triangle has area $\sqrt{k} \text{ cm}^2$. Find the value of k .



$$\text{adj} = 2\sqrt{3} \text{ cm}$$

$$\text{opp} = 2 \text{ cm} \leftarrow$$

$$\sin(30) = \frac{\text{opp}}{\text{hyp}}$$

$$\Rightarrow \frac{1}{2} = \frac{\text{opp}}{4}$$

$$\Rightarrow \text{opp} = 2 \text{ cm}$$

$$\cos(30) = \frac{\text{adj}}{\text{hyp}}$$

$$\Rightarrow \frac{\sqrt{3}}{2} = \frac{\text{adj}}{4}$$

$$\Rightarrow \text{adj} = 2\sqrt{3} \text{ cm}$$

$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \frac{1}{2} \times 2\sqrt{3} \times 2$$

$$= 2\sqrt{3} \text{ cm}^2 = \sqrt{12} \text{ cm}^2$$

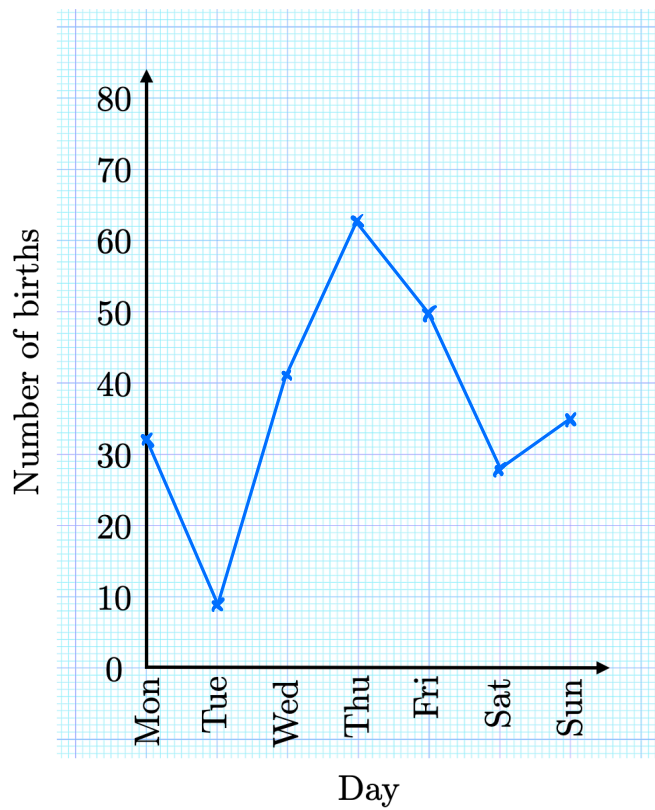
$$\text{so } k = \underline{12}$$

Question 15

This table shows the number of babies born in a town each day during a week.

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Number of births	32	9	41	63	50	38	45

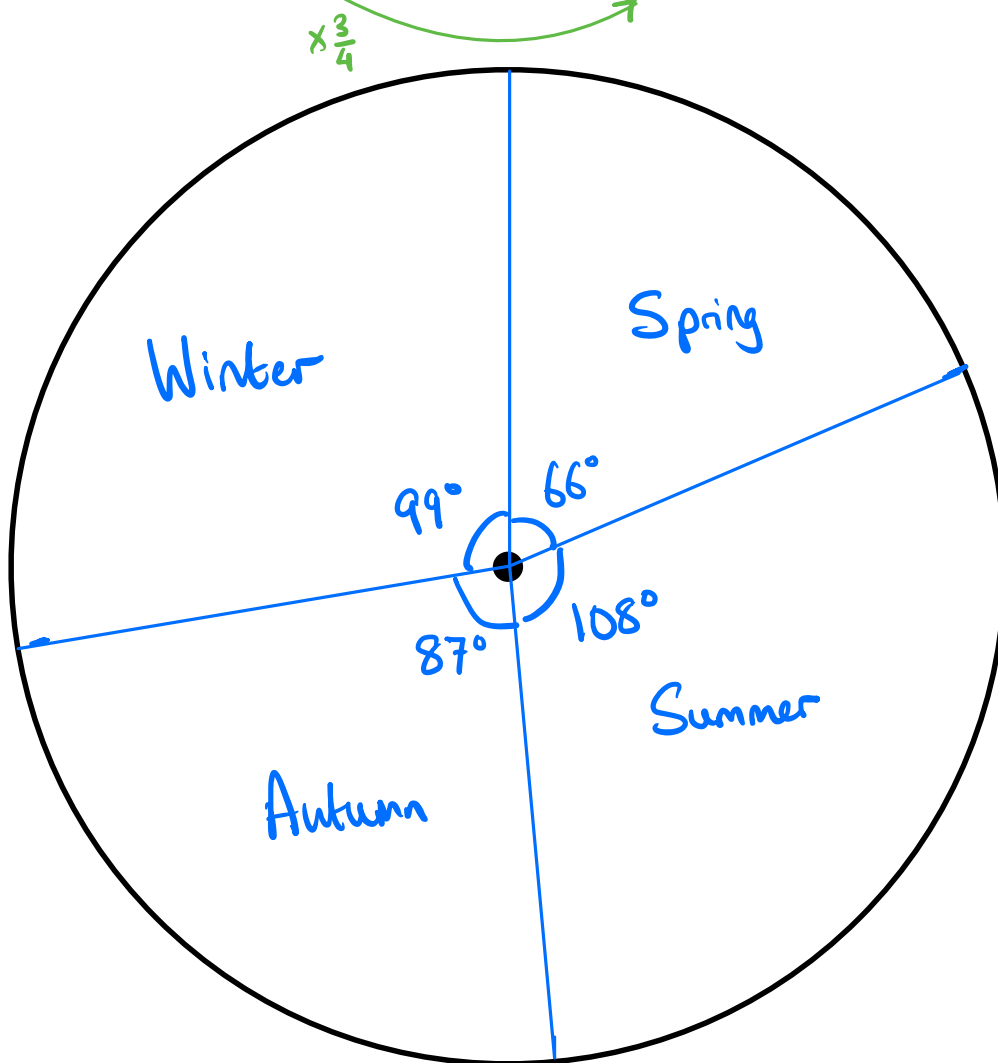
Draw a time series graph to show this information.



Question 16

This table shows the total sales made in a clothes shop during each season. Complete the table and construct a pie to show this information.

Season	Value of sales	Angle
Spring	£88,000	66°
Summer	£144,000	108°
Autumn	£116,000	87°
Winter	£132,000	99°
Total	£480,000	360°

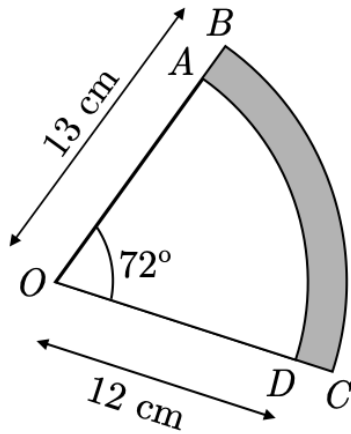


Question 17

OAD and OBC are sectors of circles with centre O .

The points O , A , and B lie on a straight line. Similarly, the points O , D , and C lie on a straight line.

OB has length 13 cm and OD has length 12 cm.



Find, in terms of π , the perimeter of the shaded region $ABCD$.

$$AB = CD = 1 \text{ cm}$$

$$\text{Arc AD} = \frac{72}{360} \times 2\pi \times 12 = \frac{24}{5}\pi \text{ cm}$$

$$\text{Arc BC} = \frac{72}{360} \times 2\pi \times 13 = \frac{26}{5}\pi \text{ cm}$$

$$\begin{aligned} \text{Perimeter} &= 1 + \frac{24}{5}\pi + 1 + \frac{26}{5}\pi \\ &= 2 + \frac{50}{5}\pi \text{ cm} = \underline{\underline{2 + 10\pi \text{ cm}}} \end{aligned}$$

Question 18

(a) A freight train is travelling at 5 m/s. Find the speed of the train in km/h.

$$\begin{aligned} 5 \text{ m/s} &= 5 \times 60 \times 60 \text{ m/h} = 18000 \text{ m/h} \\ &= \underline{18 \text{ km/h}} \end{aligned}$$

(b) Rearrange $v^2 = u^2 + 2as$ to make a the subject.

$$\begin{aligned} v^2 &= u^2 + 2as \\ -u^2 &\quad -u^2 \\ \frac{v^2 - u^2}{2s} &= \frac{2as}{2s} \\ \boxed{\frac{v^2 - u^2}{2s} = a} \end{aligned}$$

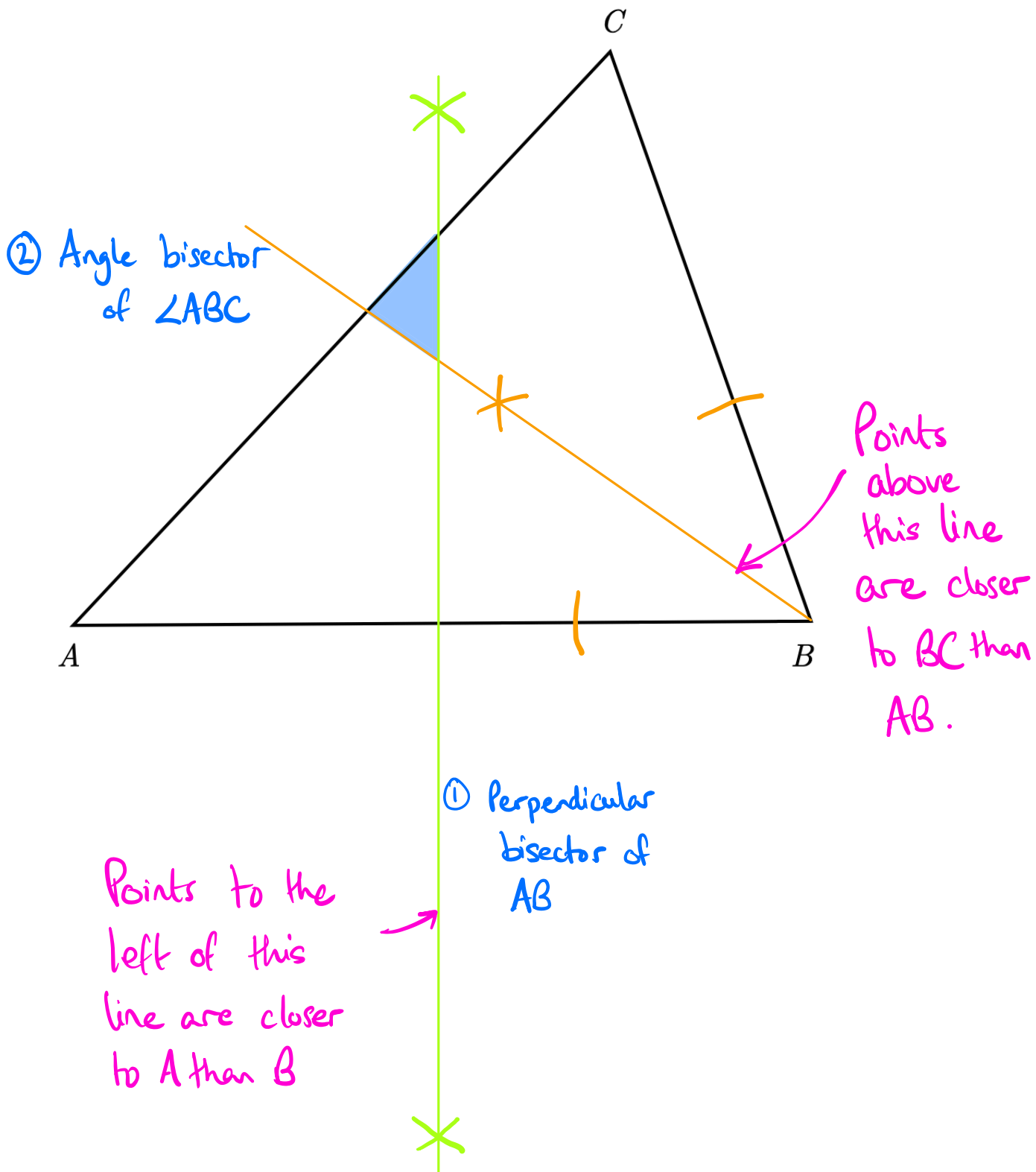
(c) The train accelerates uniformly from an initial speed of 5 m/s to a final speed of 9 m/s. The train travels 70 metres during this acceleration. Calculate the acceleration of the train in m/s^2 .

$$\begin{aligned} a &= \frac{9^2 - 5^2}{2 \times 70} = \frac{81 - 25}{140} \\ &= \frac{56}{140} = \frac{2}{5} = \underline{0.4 \text{ m/s}^2} \end{aligned}$$

Question 19

The region R contains the set of points within triangle ABC that are ^① closer to A than B and ^② closer to BC than AB .

Construct and shade in the region R .

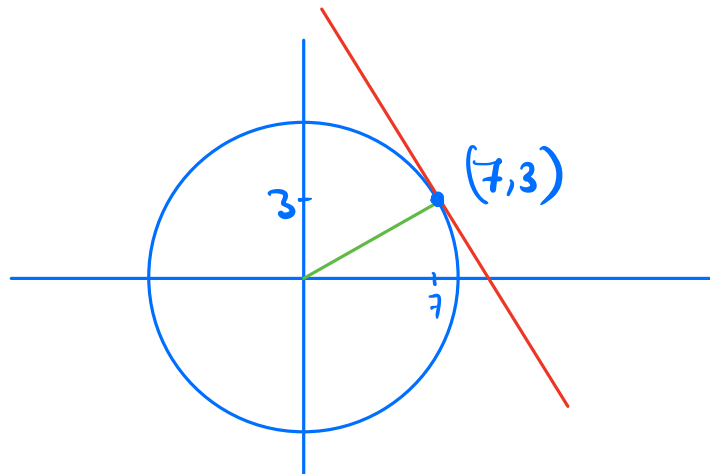


Question 20

(a) Find the equation of the circle with centre $(0, 0)$ that passes through the point $(7, 3)$.

$$x^2 + y^2 = r^2 \qquad r^2 = 7^2 + 3^2 = 58$$

$$\text{so } \underline{x^2 + y^2 = 58}$$



(b) Find the equation of the tangent to the circle at A , giving your answer in the form $y = mx + c$

The **tangent** is perpendicular to the radius at $(7,3)$

The **radius** has gradient $\frac{3}{7}$

\therefore the tangent has gradient $-\frac{7}{3}$

$$y - 3 = -\frac{7}{3}(x - 7) = -\frac{7}{3}x + \frac{49}{3}$$

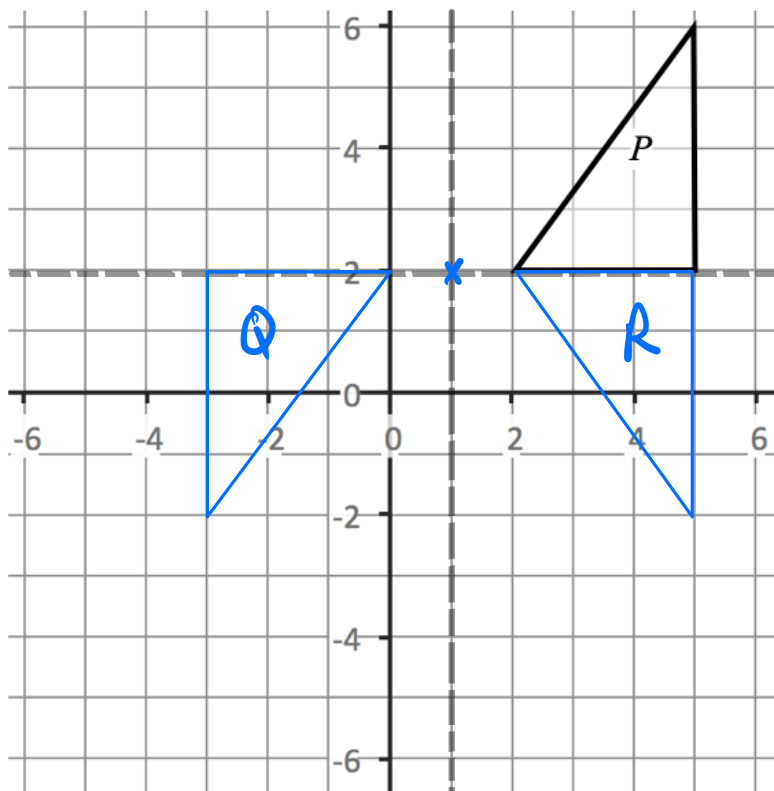
$$\Rightarrow y - \frac{9}{3} = -\frac{7}{3}x + \frac{49}{3} \Rightarrow \underline{y = -\frac{7}{3}x + \frac{58}{3}}$$

Question 21

Use the formula $u_{n+1} = \frac{(u_n)^3 - 1}{10}$ with $u_1 = -1$ to calculate u_2 .

$$u_2 = \frac{(u_1)^3 - 1}{10} = \frac{(-1)^3 - 1}{10} = \frac{-1 - 1}{10} = \frac{-2}{10} = \underline{\underline{-0.2}}$$

Question 22



- (a) Rotate shape P by 180° about $(1, 2)$. Label this rotated shape Q .
- (b) Reflect shape Q in the line $x = 1$. Label this reflected shape R .
- (c) Describe fully the single transformation that maps shape P onto R .

Reflection in the line $y = 2$